This application uses numeracy skills from the following skills units:

- **Calculation A**
- **Calculation B**
- **Calculator Use A**
- **Calculator Use B**
- **Number B**
- **Measurement B**
- **Measurement C**
- **Problem Solving**
- **Formula A**
- **Formula B**

As an electrician you need to apply the right formula in different situations.

$R = \frac{\rho \, l}{A}$ $\quad R_2 = R_1 (1 + \alpha (t_2 - t_1))$ $\quad V = IR$

$P = V I$ $\quad P = \frac{V^2}{R}$ $\quad P = I^2 R$ $\quad I = \frac{V}{R}$

where R = electrical resistance in ohms
A = area of cross-section in m^2
ρ = resistivity in ohm metres
l = length of wire in metres
R_2 = resistance of conductor at temperature t_2 °C
R_1 = resistance of conductor at temperature t_1 °C
P = electrical power in Watts
V = voltage in Volts
I = current in Amperes
α = temperature coefficient of resistance

From the list of formulae given, select the correct formula and use it to calculate the required quantity in these situations:
(Answers correct to 2 decimal places)

1 a) Find the resistance of a 200 metre length (l) of copper wire of 0.54 mm^2 cross-section area (A). Resistivity (ρ) of copper is 1.72 x 10^{-8} ohm m.

b) In an electrical circuit, resistances (R) totalling 28 ohms are connected with a 24 V supply. What current (I) flows in the circuit?

c) What is the power (P) drawn in a circuit with a 240 V (V) supply and a total resistance (R) of 108 ohms ?

d) Calculate the resistance (R_2) of a conductor at 110°C (t_2) if its resistance at 0°C (t_1) is 15.4 ohms.

The temperature coefficient of resistance (α) of the conductor is 0.00427.

2 Use transposition to make the pronumeral in brackets the subject:

a) $P = \frac{V^2}{R}$ *for* *(V)*

b) $R = \frac{r\,l}{A}$ *for* *(A)*

c) $R_2 = R_1 (1 + \alpha (t_2 - t_1))$ *for* (t_2)

Application Answers

1 a) use $R = \rho \frac{l}{A}$ to get R = 6.37 ohms

b) use $I = \frac{V}{R}$ to get I = 0.86 Amperes

c) use $P = \frac{V^2}{R}$ to get P = 533.33 Watts

d) use $R_2 = R_1 (1 + \alpha (t_2 - t_1))$ to get R_2 = 22.63 ohms

2 a) $V = \sqrt{PR}$

b) $A = \frac{\rho\, l}{R}$

c) $t_2 = \frac{R_2 - R_1}{R_1 \alpha} + t_1$

